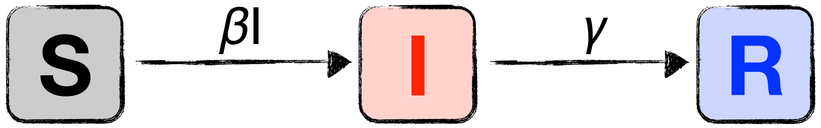
The fundamental model of disease transmission: the SIR model

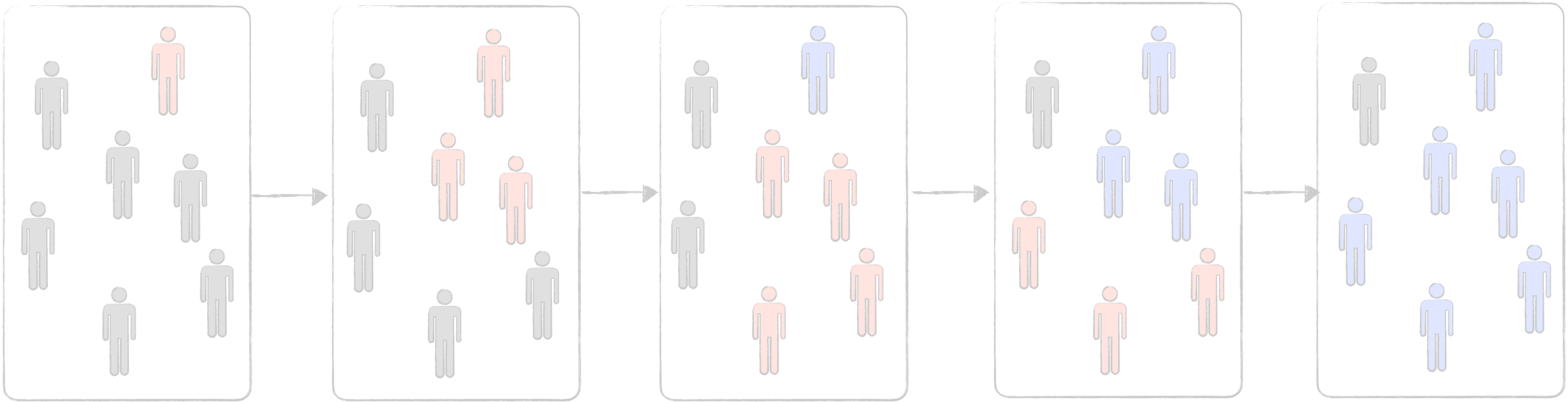
If we describe how an **individual** progresses through disease…



The **S**→**I** transition depends on **infectiousness (β)** and the **number of infectious people (I)**

The **I**→**R** transition depends on the **recovery rate (γ)**

Can we infer what will happen with the **population?**



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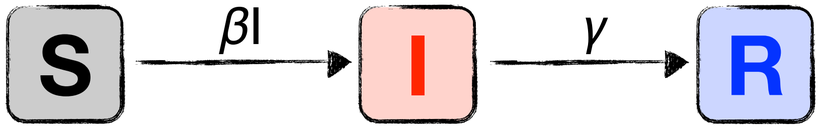

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To translate this diagram into equations,
multiply the **rates** over the arrows by the **states** at the arrow's tail:

$$\frac{dS}{dt} = -\beta IS$$

$$\frac{dI}{dt} = \beta IS - \gamma I$$

$$\frac{dR}{dt} = \gamma I$$

Solving these equations means asking: how do the number of people in S, I, and R vary over time, given the individual-level values we've put into the model?